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Articles

The Nature of Forecasting

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THE NATURE OF FORECASTING[1]

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I wish to make it clear from the outset that I am not going to discuss the mechanics or the techniques of forecasting. I know little of such techniques as cost benefit analysis, discounted cash flows, etc. My experience is limited to what I may call global forecasting in connection with the national income and balance of payments. I am more concerned with the character of forecasting and its validity, which I regard as something prior and more basic than the actual techniques used. It is these aspects that I wish to discuss.

What I have to say is probably very obvious but nevertheless I think it of fundamental importance to try and clarify the issues involved. Although these things may appear to be obvious I get the feeling from time to time when people discuss forecasting and matters involving forecasting that these obvious points seem to be submerged or lost sight of and the discussion tends to be unrealistic for this reason.

Perhaps we should start by asking why we should forecast in the first place. As I see it, forecasting in a simple Garden of Eden society is unnecessary. Nature is the provider and one lives with the present in a state of bliss but go North or South where winters and seasons are meaningful and apples on trees are there only once a year, then decisions about tomorrow become essential for survival. As society becomes more complex, more urbanised and industrialised and dependent on trade with other countries decisions about tomorrow are essential and become an intrinsic part of today's life.

The individual is faced with the choice of consuming or investing. Investment involves abstaining from consumption today in order to establish a source for future flows of consumption. Such choices have to be made not only at the individual level but also at the corporate and state level. The very structure of modern economies is adapted to this mass of choices in that industry is made up of consumption goods, intermediate goods and investment goods industries. This structure of industry, however, is not necessarily always in exact accord with the mass of society's choices.

We have established that decisions on consumption and savings are essential to life and survival. Such decisions involve judgement which, in turn, involves some form, either explicit or implicit, of assessment of the future, which we may describe as forecasting. I now wish to explore the essence of forecasting.

Clearly, we are not dealing with probabilities. Life and the future are not probabilistic. Probability is an assignable number representing the chance or frequency of an event or non-event. In a probabilistic situation, the event or non-event is a member of a definable class of events. Given the characteristics of the class, probabilities can be calculated *a priori* and in practice if the experiment is completely without bias, the frequency of occurrence in a very large number of trials tends to approximate to the *a priori* probability. The law of averages or large numbers operates whether we are dealing with the toss of a coin or playing on a roulette wheel, and in practice if there is any discrepancy between the *a priori* probability and the asymptotic frequency this discrepancy

1. Paper read to the Society in September, 1969.

is not taken as a denial of the law of averages but cause to suspect bias in the dice, so to speak.

The number of events or non-events in life is not finite and certainly not definable. Probability concepts are therefore out of place or to be blunt, irrelevant. What then can we resort to?

Man clearly has no powers of prediction but he is equipped and powerfully so, with memory which is either cerebral or recorded. He has an accumulated record of the past but he has no fore-knowledge of the future. He is in fact always living on the frontier of experience, that is today. Beyond today lies a totally black void and yet today he must make decisions that affect his fortunes in the existence of tomorrow. He must rely on his past and some type of thought which we can admit to being akin to probability. We need a new set of words or ideas which are sufficiently descriptive of this thought. The words which come to mind are degrees of certainty and potential surprise. For example, we can say we are fairly certain or very certain that something will happen or we can say we will not be surprised that this will or will not happen.

If any of you studied economics in the fifties you will no doubt recall the tiresome controversy as to whether utility was ordinal or cardinal, that is whether utility could be ordered without necessarily being measured or otherwise. The way we use the words certainty and surprise in the English language is ordinal and from this point of view they are appropriate for the semantics of forecasting. We can, for example, be more or less surprised without quantification. "Certainty", in the loose verbal sense and "surprise" are thus non-mathematical concepts which again is correct as we are dealing with human cognition and emotions. We are not dealing with matters external to human thought, to which the concept of probability applies. We are essentially dealing with human thought and attitudes towards events or the possibility of events to which non-mathematical concepts must apply.

Thus, man living with the past and projecting himself forward will express a feeling of relative certainty about events in the future. To put it inversely he can express a degree of potential surprise towards the occurrence of the events.

Just as man needs an ego to give him the effrontery to act, so he needs a sense of conviction about the future to enable him to decide. He can have this sense of conviction about the future in the full knowledge that there is no full certainty of events occurring, without in any sense being inconsistent. He is in fact dealing with a situation of complete uncertainty and yet he must gamble with the future for he knows that if he does not he is most unlikely to survive. But what of the sense of conviction?

Depending on the type of event it is going to be a function of time. The further off the less conviction. As time recedes he can place less and less confidence in his expectations, even though in the event, by accident, he can be closer to the mark in fifteen years' time than he is in a year's time. What it amounts to is that he is more and more unsure of himself as time recedes.

When he is very unsure of himself, he can be in a most unfortunate state of indecision and he will tend to look about for some kind of driftwood which he can hold on to, to give him more confidence. He will be inclined to accept the opinion of that elevated higher being, the professional forecaster. This modern-day Cassandra is supposed to provide society with forecasts which

will give the businessman and Government that much more confidence in their decisions. It may also give them a scapegoat which they are looking for if things go awry.

The professional forecaster, however, is no better placed to know the future than the next man. He may, however, be more systematic, less biased and more knowledgeable of the past but these are the only things he may be credited for. The good forecaster must surely appreciate this and he must regard his work honestly and with humility.

I know from my own experience with forecasting how quickly a sense of conviction about the future fades away. I am quite happy to provide forecasts for a year ahead with a fair degree of confidence, but I have very much reduced confidence in my forecasts two years ahead. I am totally unhappy about providing a five-year forecast, because what I am doing is nothing more than putting apparently reasonable numbers on paper. The reasonableness of the numbers is a matter of judgment on the basis of past experience of growth rates, structural ratios and so on.

In practice, I think there is a subtle change in the nature of the forecast when the forecast is a long distance one. The forecasts tend no longer to be true forecasts as such, but rather projections of the present, or possibly the immediately forecast future—such projections tend to be mechanical exercises with all the structural relationships of today tending also to remain unchanged.

A subtle change in attitude in the forecaster also takes place. He is less concerned with the long-distance forecast being a reliable prediction of events or quantities and more concerned with the correctness of the relationships of the projections—to see that the projections are consistent and acceptable in the light of present experience.

However, in fairness this is the best he can do. He will hope for the best that the projections will be a fair reflection of the position in five or ten years time. He may also secretly hope that either he won't be around or his projections will be forgotten when the five years have elapsed.

Clearly not only the forecaster, but those using his forecasts must accept that much less confidence can be placed on the forecasts as the time horizon recedes.

The question now arises whether in practice reliability or accuracy of prediction is all that important. I must generalize now and in so doing I recognize there could well be exceptions depending on the problem in hand. I am assuming, of course, that a forecast is to be made for some particular purpose, and I would emphasize that forecasting must be functional, for otherwise it is fiction and a waste of the forecaster's time and effort.

Let us take the example of installing new plant, say a new chocolate-making plant. In general, plant comes in discrete quantities—there is not a continuous distribution of sizes although there may be a choice of a few different sizes. Now, say a particular piece of equipment will increase plant capacity by 30 per cent but the larger size available may increase it by 50 per cent. There is normally a pretty big gap in the various sizes. A crude forecast may tell us that demand will increase by 20 per cent in five years' time but a very detailed

and supposedly reliable forecast tells us that demand will increase by 25 per cent. In both instances we would choose the small plant. Even if the forecast was a 10 per cent growth we may have decided to choose the small plant, although there is a point where we would have decided not to install a new plant at all. Taking this further, say we installed the smaller plant and found growth of demand, much to our surprise, was some 50 per cent in the first five years, what would we do? We would simply install another machine. Our only source of possible regret is that the larger machine in the first instance may have been cheaper in terms of discounted redemption payments than installation of the two smaller machines at different points of time.

I think a fundamental point emerges from this and that is that our uncertainty can and more often than not must be countered by flexibility. We must always put ourselves in the position of being able to adapt to changing circumstances. I would say that this is an essential component of decision-making: allowing for flexibility of action in the future. Whether we are investing in schools, hospitals, chocolate-making machinery, computer capacity, etc., we must know that the installation will some day, sooner or later, be fully absorbed. Accordingly we should design the installation to allow specifically, if possible, for further extension later. The same lesson applies to obsolescence.

The relevance of flexibility then is that flexibility compensates for our lack of certainty about the future and the inevitability of having made incorrect assessments of the future.

I think I can express what I have been saying in these formal terms. A forecast of X will be incorrect at the specified time *t* but will be correct at some other time t. It is rare that it is crucial that X must coincide with t. We will invariably have sufficient time or warning that our forecasts are proving wrong and further action is required to meet the changing circumstances.

Another question: If we are forecasting electricity consumption or butter consumption, say, is it sufficient to have a forecast specific for that purpose—it may well be a projection—or is it essential to have a full and elaborate forecast of the economy as a background forecast? It may well be argued that we cannot make a proper forecast for the item in hand, unless we make an assessment of all the factors influencing the item such as electricity consumption, and this requires the full-scale forecast of the economy. I recall some years ago Dr. Robson, who was commissioned by the Federal Government to make an assessment of the future steel industry, complaining there was no available long-term forecast of the economy. His work may well have been easier if a full-scale forecast had been available, if only because someone else had done the main donkey work, but would his conclusions have been any better? I would suggest not. There is, I think, the mistaken assumption that the detailed background forecast will in the first place be reliable and in the second, improve the reliability of the specific forecast of the item. In any case, as I have already tried to show, does it really matter? As long as we retain the right degree of flexibility and open-mindedness we need not overstrain ourselves in the direction of attaining that "will-o'-the-wisp", absolute reliability in our forecasts.

There can be an intrinsic weakness to forecasts of the entire economy with its elaborate detail for all sectors. The weakness is associated with consistency of the structural relationships. It is agreed that a complete forecast will ensure

consistency, but there is a very real danger of consistency becoming a fetish. The consistency generally means consistency in terms of relationships known to exist at present. These relationships themselves are subject to change and the forecasts could fail—and seriously so—on this score.

It is as if we are dealing with a complex mathematical formula which has variables and coefficients—the coefficients defining the relationships—and finding not only the variables but also the coefficients changing.

Take the example of the sanctions campaign against Rhodesia. On the assumption of unchanged relationships, an attack on exports would effect a serious downturn in national activity and reduction in personal incomes. The counter action taken by industry and government was, in formal terms, in respect of the relationships and national activity and personal incomes have increased. The structure of the economy today is very different from what would have been predicted in 1965.

I have no intention of discussing development planning in this paper, but I would like to apply the conclusions I have already reached to the type of forecasts which characterise the more sophisticated type of development planning. I am thinking now of the development plans that have been spilled out all over the world, but especially in developing countries with all the window-dressing of full-scale forecasts five years ahead and the path to be taken to achieve the goals of the plan.

There has from time to time been public clamour in this country for similar plans. It has, however, never been clear to me whether there has indeed been full understanding of what development planning involves and what type of planning the clamour is for. I have at least gained the impression that much of this clamour is for full-scale forecasts of the economy. Now surely there is some confusion here.

It is possible to have a five-year forecast without any planning at all. It is equally possible to have development planning without a five-year forecast. But the forecast that is normally published with a development plan is essentially a different type of animal. It is a projection of the economy based on the assumption of the successful implementation of plans at their appropriately phased points along the time path. The forecast is essentially a model of the economy five years hence assuming everything goes according to plan. In the minds of the planners, of course, the model and the forecast in the sense of being a prediction of the state of affairs in five years time are one and the same thing. For what is a plan if it is not to be implemented?

The matter is complicated by the fact that all the variables are not under the control of the planners, for example exports, and there are accordingly significant elements of the model which are pure forecasts. The model is thus an amalgam of forecasts and asserted developments from plans. It really is an heroic construction of assumptions, predictions and assertions and it normally entails a monumental effort on the part of the planners.

Having suffered so much in preparing such a model, I can well appreciate how loth the planners are to change it as circumstances change, as they invariably do. A rigid attitude of mind towards the plan is inevitable and sooner or later the plan is either abandoned or subjected to public derision.

The fault I think lies in the planners succumbing to the temptation of saying such and such an investment must take place at such and such a time—it has to be phased in with other developments—and the final outcome of all these developments after five years will be like this. No doubt all this is believed to have political importance in that it demonstrates to the people that they have a dynamic government bursting with plans and determination. No doubt it is also believed that the published plan and its model will inspire the people to greater effort—if they can understand it all.

From what I have said already, I hope it will be clear that my preference would be for a less flamboyant approach to planning. I fail to see the necessity for a five-year forecast or model of the economy—more positively I see dangers of inflexibility and self-deception in such models. I see virtue in being less precise but nevertheless having well formulated policies, ideas and plans—and also making known to the private sector opportunities available—all of which will be implemented as circumstances allow or demand. This may appear amorphous but I think it realistic. Under this system the growth rate will not be a rate to be imposed, but not achieved, by the planners but will be the outcome of the implementation of policies and the natural and stimulated dynamism of the economy.